a first register for storing a whole-number multiple of one word of data; and,

a second register for storing a set of data that corresponds to contiguous print elements, a number of which is a whole-number multiple of a number of time divisions employed in time-division drive.

REMARKS

Claims 1-18 are now presented for examination. Claims 1-3, 5-9, 12, and 14 have been amended to define still more clearly what Applicant regards as his invention, in terms which distinguish over the art of record. Claims 17 and 18 have been added to assure Applicant of a full measure of protection of the scope to which he deems himself entitled. Claims 1, 2, 5-9, 12, and 14 are independent.

The Office Action objected to the specification because the legal phraseology "discloses" is used in the Abstract. Applicant has corrected the Abstract accordingly. Withdrawal of the objection to the specification is respectfully requested.

Claims 1-16 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent 5,838,888 to Oda.

Claim 1 is directed to a data processing method for processing data stored in storage means in an image printing apparatus subjected to time-division drive of a printhead. The data processing method comprises the step of rearranging one word of data corresponding to a plurality of contiguous print elements provided on the printhead, that is

stored divisionally in two or more address regions in the storage means, to store the data in one address region in the storage means.

One important feature of Claim 1 is that one word of data corresponding to a plurality of contiguous print elements provided on the printhead, that is stored divisionally in two or more address regions in the storage means, is rearranged to store the data in one address region in the storage means. By virtue of this feature, the image printing apparatus is capable of reading one word (of, for example, 8 bits) of data from the one address region in the storage means and transferring all of the data to (for example, 8 elements of) the printhead.

Oda relates to an image recorder which has a print buffer for storing print data received from an information processor, a printing head having nozzles for plural channels that print on the basis of the print data stored in the print buffer, a 4-bit shift register unit that temporarily stores the print data of the print buffer and sequentially supplies the print data for each dot to the printing elements, and a buffer controller that divides the nozzles into odd and even channel groups and transfers the print data corresponding to the channel groups with a staggered timing to the 4-bit shift register unit from the print buffer.

At most, as discussed above, Oda discloses an image recorder having a 4-bit shift register unit that temporarily stores the print data of the print buffer and sequentially supplies the print data for each dot to the printing elements. However, at column 4, lines 59-61, Oda states that "as shown in FIGS. 9B and 9C, this data table is divided into data areas of 8 bits as a transmission unit of the print data." Oda also states, at column 6, lines 17-20, that "the storage of the print data of a four bit formation into the 0 channel shift

register 52A and 1 channel shift register 52B is repeated alternately at every two pulses of the printing clock." Therefore, the image recorder of Oda must read out one byte of data from the print buffer, in order to transfer the four bits of data to the printhead.

Nothing has been found in Oda that would teach or suggest rearranging one word of data corresponding to a plurality of contiguous print elements provided on the printhead, that is stored divisionally in two or more address regions in the storage means, to store the data in one address region in the storage means, as recited in Claim 1.

Accordingly, Applicant respectfully submits that Claim 1 is patentable over Oda.

Independent Claims 2, 5, 6-9, 12, and 14 each contain features which are similar to the features discussed above in connection with Claim 1. Accordingly, Claims 2, 5, 6-9, 12, and 14 are believed to be patentable for substantially similar reasons to those discussed above in connection with Claim 1.
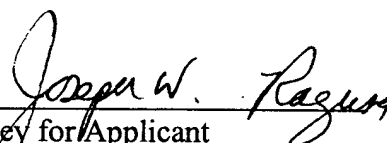
A review of the other art of record has failed to reveal anything which, in Applicant's opinion, would remedy the deficiencies of the art discussed above, as references against the independent claims herein. Those claims are therefore believed patentable over the art of record.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual consideration or reconsideration, as the case may be, of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicant respectfully requests favorable reconsideration and early passage to issue of the present application.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,

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VERSION MARKED TO SHOW CHANGES TO ABSTRACT

Please substitute the Abstract with the following replacement Abstract.

–[Discloses a] A method of raising the printing speed of an image printing device when time-division drive is performed,[. In] utilizes time-division drive using four times divisions[, image]. Image data is read out of the editing buffer of a RAM in regular order, in the form of a staircase, four dots at a time, and the image data is rearranged in the form of a staircase of eight dots in a print buffer within the same RAM. This makes it possible to transmit data from the RAM to a printhead one byte at a time in an efficient manner.--

VERSION MARKED TO SHOW CHANGES TO CLAIMS

1.   (Amended) A data processing method for processing data stored in [a print buffer] storage means in an image printing apparatus subjected to time-division drive of a printhead, comprising a step of:

rearranging [the data in such a manner that] one word of data corresponding to a plurality of contiguous print elements provided on the printhead, that is stored divisionally in [one] two or more address regions in the [print buffer] storage means, to store the data in one address region in the storage means [are occupied with one word of data corresponding to a plurality of contiguous print elements provided on a printhead of the image printing apparatus].

2.   (Amended) A data processing apparatus for processing data stored in [a print buffer] storage means in an image printing apparatus subjected to time-division drive of a printhead, wherein [the data] one word of data corresponding to a plurality of contiguous print elements provided on the printhead, that is stored divisionally in two or more address regions within the storage means, is rearranged in one address region within the storage means [in such a manner that one or more address regions in the print buffer are occupied with one word of data corresponding to a plurality of contiguous print elements provided on a printhead of the image printing apparatus].

3.   (Amended) The apparatus according to claim 2, <u>further</u> comprising:

[first storage means for storing data of a plurality of words; and]

delay means for delaying [an amount] <u>a set</u> of data that corresponds

to <u>contiguous print elements, a number of which is</u> a whole-number multiple of a number

of time divisions employed in time-division drive, said delayed data being from the data

that has been read out of said [first] storage means.

5.   (Amended) An image printing apparatus subjected to time-division

drive in which n represents the number of time divisions and one word is composed of m

bits, comprising:

data processing means for <u>reading n-bit data corresponding to n</u>

<u>contiguous nozzles serves as one unit and</u> storing contiguous 1-bit data, [(] where the

lowest common multiple of n and m is 1, [)] in one [row] <u>address</u> within a print buffer [,

said data being from data output by driving the apparatus one time;

wherein n-bit data corresponding to n-number of contiguous nozzles

serves as one unit].

6.   (Amended) An image printing apparatus for processing data in

which one word consists of eight bits, comprising:

printhead driving means for discharging ink from four contiguous

nozzles of a printhead at different timings;

a print buffer for outputting image data to said printhead driving

means; and

data transfer means for transferring data to said print buffer;

said data transfer means rearranging sets of 4-bit data, each set of

which corresponds to four contiguous nozzles of the printhead, in such a manner that two

sets of data are [rendered contiguous] <u>stored in one address within said print buffer as 8-bit</u>

<u>data</u>.

7.   (Amended) An image printing apparatus subjected to time-division

drive, comprising:

storage means for storing image data;

a printhead for performing printing based upon the image data read

out of said storage means; and

means for [packing] <u>reading</u> image data <u>from two or more address</u>

<u>regions within said storage means</u>, which will be printed by driving said printhead one

time, [before the image data is transmitted to said printhead,] <u>and packing</u> the image data

[being packed] in numbers of bits serving as units in which data is read from and written to

said storage means <u>to store the packed image data in one address region within said storage</u>

<u>means, before the image data is transmitted to said printhead</u>.

8.   (Amended) A method of controlling an image printing apparatus

subjected to time-division drive and having storage means for storing image data and a

printhead for performing printing based upon the image data read out of said storage

means, said method comprising a step of:

[packing] reading image data from two or more address regions

within said storage means, which will be printed by driving said printhead one time [,

before the image data is transmitted to said printhead,]; and,

packing the image data [being packed] in numbers of bits serving as

units in which data is read from and written to said storage means to store the packed

image data in one address region within said storage means, before the image data is

transmitted to said printhead.

9.   (Amended) A computer-readable memory storing a control program

for controlling an image printing apparatus subjected to time-division drive and having

storage means for storing image data and a printhead for performing printing based upon

the image data read out of said storage means, said control program being a program for:

[packing] reading image data from two or more address regions

within said storage means, which will be printed by driving said printhead one time; and,

[before the image data is transmitted to said printhead,]

packing the image data [being packed] in numbers of bits serving as

units in which data is read from and written to said storage means to store the packed

image data in one address region within said storage means before the image data is

transmitted to said printhead.

12.   (Amended) A data processing method for processing data stored in

a print buffer in an image printing apparatus which performs printing by causing a

printhead to scan, said printhead having a plurality of print elements arrayed at

predetermined angles with respect to the scanning direction of the printhead and subjected

to time-division drive, comprising a step of:

rearranging [the data in such a manner that] one word of data

corresponding to a plurality of contiguous print elements provided on the printhead, that is

stored in two or more address regions in the [print buffer] storage means, to store the data

in one address region in the storage means [are occupied with one word of data

corresponding to a plurality of contiguous print elements provided on a printhead of the

image printing apparatus].

14.   (amended) A data processing apparatus for processing data stored in

a print buffer in an image printing apparatus which performs printing by causing a

printhead to scan, said printhead having a plurality of print elements arrayed at

predetermined angles with respect to the scanning direction of the printhead and subjected

to time-division drive, wherein [the data] one word of data corresponding to a plurality of

contiguous print elements provided on the printhead, that is stored divisionally in two or

more address regions within the storage means, is rearranged <u>in one address region within</u>

<u>the storage means</u> [in such a manner that one or more address regions in the print buffer are

occupied with one word of data corresponding to a plurality of contiguous print elements

provided on a printhead of the image printing apparatus].

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